

# TECHNICAL PROBLEMS OF MULTIROUND DEMOGRAPHIC SURVEYS





Le Programme International des Laboratoires pour les Statistiques de la Population se consacre au perfectionnement des méthodes de mesure de variation des populations et à l'analyse des données démographiques. C'est dans ce but que le Programme cherche à établir et à subventionner des laboratoires d'expériences où de nouvelles méthodes de mesure puissent être expérimentées, et où, dans les cas appropriés, l'analyse de données déjà existantes puisse être développée. Ces projets sont basés sur la coopération entre l'Université de la Caroline du Nord à Chapel Hill et les institutions scientifiques de divers pays. Le programme se réalise grâce à la participation de ces institutions et à l'assistance apportée par l'Agence pour le Développement International du Gouvernement des Etats-Unis. Des publications scientifiques et techniques sont distribuées gratuitement à un nombre limité d'institutions et de particuliers qui s'intéressent aux problèmes de mesure démographique. Les opinions émises et les conclusions exprimées sont celles de leurs auteurs respectifs, sans engager les institutions dont ils dépendent.

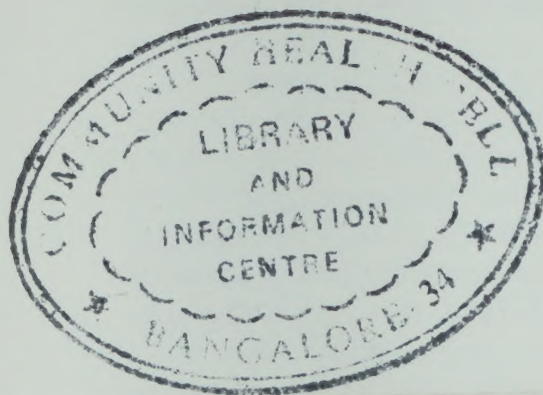
El Programa Internacional para Estadísticas de Población se dedica a la investigación de mejores métodos para la medición de cambios poblacionales y al análisis de datos demográficos. Con este fin, el Programa espera establecer y mantener laboratorios experimentales en los cuales se puedan ensayar nuevos métodos de medición y, cuando sea apropiado, analizar datos existentes. Los proyectos se basan en acuerdos cooperativos entre la Universidad de Carolina del Norte en Chapel Hill e instituciones científicas de varios países. El Programa se lleva a cabo gracias a la participación de estas instituciones y a la asistencia de la Agencia para el Desarrollo Internacional del Gobierno de los Estados Unidos. Publicaciones científicas y técnicas son distribuidas, sin costo alguno, a un número limitado de instituciones y personas interesadas en problemas de medición demográfica. Las diferentes opiniones y conclusiones expresadas son responsabilidad de los autores respectivos, y no deben ser atribuidas a las instituciones patrocinadoras.

The International Program of Laboratories for Population Statistics is dedicated to research on improved methods of measurement of population change and to the analysis of demographic data. The Program seeks to establish and support laboratories where new measurement methodology can be developed, and where, in appropriate cases, the analysis of existing data can be developed. These projects are based on cooperative agreements between the University of North Carolina at Chapel Hill and scientific institutions in various countries. The program is realized through the participation of these institutions and the assistance provided by the Agency for International Development, U.S. Government. Scientific and technical publications are distributed free of charge to a limited number of institutions and individuals interested in population measurement problems. The opinions and conclusions expressed are those of the respective authors and do not engage the sponsoring institutions.

***Community Health Cell***  
**Library and Information Centre**

# 359, "Srinivasa Nilaya"  
 Jakkasandra 1st Main,  
 1st Block, Koramangala,  
 BANGALORE - 560 034.  
 Ph : 2553 15 18 / 2552 5372  
 e-mail : chc@sochara.org





# TECHNICAL PROBLEMS OF MULTIROUND DEMOGRAPHIC SURVEYS

Christopher Scott

International Program of Laboratories for Population Statistics  
Forrest E. Linder, Director

The Department of Biostatistics  
School of Public Health

The Carolina Population Center

The University of North Carolina  
Chapel Hill, N. C. 27514  
U.S.A.



La encuesta demográfica de seguimiento con múltiples visitas es un intento de superar algunas de las fuentes de error inherentes en la encuesta con una sola visita, principalmente errores de omisión y de fecha. El autor discute algunos de los problemas prácticos asociados con las encuestas de seguimiento en el contexto de su posible uso en países en desarrollo, incluyendo recomendaciones en la medida en que es posible. La mayor parte de la discusión se aplica también al sistema de doble registro.

Se recomienda el uso de muestreo por área, con una cobertura del 100% de cada conglomerado. Este es el único modo efectivo de definir la muestra que debe cubrir cada enumerador. El tamaño óptimo de cada conglomerado es generalmente una población de algunos cientos. El número y frecuencia de las visitas es considerado a la luz de los costos y de la confiabilidad de los datos. Se concluye que el período de encuesta total debe ser de un año por lo menos, con un máximo de seis meses entre las visitas.

Las dificultades de confrontación prácticamente eliminan el uso de la técnica de seguimiento "ciego" en países en desarrollo. El enumerador en las visitas de seguimiento debe tener una lista de los miembros de la vivienda que han sido enumerados en la visita anterior. En estas circunstancias, sin embargo, es esencial supervisar cuidadosamente al enumerador.

El autor recomienda un programa específico para el procesamiento de los datos sobre nacimientos y defunciones, en lugar de incluir éstos como parte del registro de cada persona. También se presentan procedimientos para derivar las tasas vitales de tal modo que se tomen en cuenta las muertes infantiles, los nacimientos en que la madre fallece antes que se registre el acontecimiento y los nacimientos y defunciones que corresponden a personas que inmigran o emigran del área en estudio entre las visitas.

Se discuten las características de 3 cuestionarios. Estos son el formulario de CEA de 1966, el formulario de la encuesta de población de Ghana de 1966-67 (éste no ha sido implementado) y el formulario de la encuesta demográfica de Nigeria de 1965-66. Los cuestionarios han sido reproducidos en un anexo.

◀ a nuestros lectores

### to our readers ▼

The multiround follow-up survey is an attempt to overcome some of the sources of error inherent in the single-round approach, notably errors of omission and errors of dating. The author discusses some of the practical problems associated with follow-up surveys in the context of their use in developing countries, giving specific recommendations wherever possible. Much of the discussion applies also to the dual record method.

Area sampling is recommended, with 100 per cent coverage of each sample cluster; this is effectively the only way of defining for the enumerator the sample that he must cover. Optimal cluster size is generally a population of a few hundred. The number and frequency of rounds is considered in the light of costs and reliability of data. It is concluded that the total survey period should be at least one year with a six-month maximum period between rounds.



La méthode de l'observation suivie, par enquête à passages répétés, est une tentative pour surmonter certaines des causes d'erreurs inhérentes aux enquêtes à passage unique, notamment les erreurs par omission et dans le temps. L'auteur examine quelques problèmes pratiques posés par l'organisation de ces enquêtes dans les pays en voie de développement en donnant dans la mesure du possible des recommandations précises. Une grande partie des réflexions s'applique aussi à la méthode de la double collecte.

Le sondage en grappes est recommandé: en effet c'est la seule méthode qui permette de définir pour l'enquêteur l'échantillon qu'il doit couvrir. La taille optimale des grappes correspond généralement à un effectif de quelques centaines d'habitants. L'auteur étudie le nombre et la périodicité des passages à la lumière des coûts de l'opération et de la précision des données, et conclut que l'enquête devrait durer au moins un an avec un intervalle de 6 mois au maximum entre les passages.

Les difficultés de couplage rendent presque impraticable la méthode "à l'aveugle" par laquelle les passages sont organisés en indépendance complète l'un de l'autre. L'enquêteur doit donc disposer lors d'un passage donné de la liste des membres des ménages établie au cours du passage précédent. Cependant ces conditions exigent une surveillance très minutieuse.

En ce qui concerne le traitement de l'information l'auteur recommande l'utilisation d'un programme spécial pour le dépouillement des naissances et des décès plutôt que de les traiter avec les données relatives à chaque individu. Il décrit la méthode pour calculer les taux démographiques en tenant compte des décès infantiles, des naissances d'enfants dont la mère meurt avant qu'on ait pu enregistrer la naissance, et des événements concernant des personnes qui entrent dans l'aire de sondage, ou qui y partent, entre deux passages.

Enfin, l'auteur examine les caractéristiques de trois questionnaires qui sont reproduits en annexe: celui préparé par la CEA (1966), celui proposé (mais non utilisé) pour l'enquête démographique du Ghana (1966-67) et celui employé en 1965-66 dans l'enquête démographique du Nigéria.

Difficulties of matching virtually rule out the "blind" follow-up technique in developing countries. The enumerator in the follow-up rounds must be provided with the list of household members enumerated in the preceding round. However, in these circumstances very careful supervision of the enumerator is essential.

The author recommends a specific data-processing program for vital events, rather than the alternative of including them as part of the data record for each person. Arrangements are also presented for deriving the vital rates in such a way as to take account of infant deaths, of births to women who die before the birth is recorded, and of births or deaths of persons who move into or out of the sample area between rounds.

The features of three questionnaires are discussed. These are the 1966 ECA schedule, the 1966-67 Ghana population survey schedule (not implemented), and the 1965-66 Nigerian demographic survey schedule. The questionnaires are reproduced in an annex.







# TECHNICAL PROBLEMS OF MULTIROUND DEMOGRAPHIC SURVEYS\*

Christopher Scott

## I. Background

1. It has repeatedly been shown that vital events are not accurately reported when single-round retrospective surveys are used. In these inquiries, the respondent is asked to recall all births and deaths occurring within a fixed period, typically the preceding twelve months. The method has been found to lead to both errors of omission and errors of dating. Gross errors approximating 20 per cent for births and 40 per cent for deaths have been reported in developing countries. [1,2]

2. The multiround follow-up survey is an attempt to overcome some of the sources of error inherent in the single-round approach. [3] Basically, the idea is to carry out a first round in which the enumerator prepares a list of persons to be followed by the survey (selected as a probability sample) and then to visit the same sample after an interval in order to record the changes that have occurred. Further visits may follow at appropriate intervals, so that the sample of households then becomes a sort of vital-rate "panel."

3. It is obvious that this method, though more expensive, can be expected to reduce errors of both omission and dating, but it does not solve all the problems. In particular, infants who are born after one round and die before the next can only be detected by the retrospective approach, and there are difficulties in detecting events associated with persons who leave the sample area between rounds.

4. Although follow-up surveys have been used in many countries for determination of

vital rates (India, 1958-1959 [1]; Brazil, 1961 [4]; Morocco, 1961-1962 [2]; Indonesia, 1961-1962 [5]; Nigeria, 1965-1966 [6]; Tunisia, 1968-1969 [7]; [8]), there does not appear to be any published description of the detailed practical problems which they present. [9] The ultimate purpose of this paper is to provide a basis for the preparation of a manual on demographic surveys for use in the African region.

5. Several countries of Africa and Asia have instituted a type of vital rate estimation project which consists of two independent data-collection operations, one of these being essentially a civil registration exercise and the other a multiround survey, both following the same probability sample of the population over a period of years. In these projects, vital rates are estimated after an attempted matching of the two operations. The best known example is perhaps the Population Growth Estimation (PGE) project in Pakistan, but similar operations have been carried out in Colombia, India, Kenya, Korea, Liberia, Malawi, Morocco, Philippines, Thailand, and Turkey. [10] It is obvious that these projects have something in common with multiround follow-up surveys, and much of the present paper will apply to them.

6. It will be appreciated that the use of sample surveys to estimate vital rates is typical of developing countries; developed countries have other sources for such estimates. The context of a developing country is therefore an implicit assumption throughout this paper.

## II. Sample Design

7. Most demographic surveys in developing countries have made use of area cluster

---

\*Prepared for the United Nations Economic Commission for Africa and reprinted with adaptations from *Methodology of Demographic Sample Surveys* (ST/STAT/SER.M/51), New York: United Nations, 1971, pp. 64-85.



sampling, in the sense of complete coverage of the population within the selected area units. Advantages of this procedure have been set forth in, for example, *Sampling for Demographic and Housing Surveys and Civil Registration*, [11] a paper prepared by the United Nations Economic Commission for Africa (ECA).

8. In the case of follow-up surveys, the advantages are even more overriding; in a society of high mobility and lacking an address system, there is almost no way of defining for the enumerator the sample that he must cover than to instruct him to interview all households within his area. When households change their composition between rounds, problems of identity and sampling become almost intractable unless the coverage can be defined by reference to a criterion that is independent of the households themselves. One African country, which attempted the method of sampling households within areas, later reported on the great difficulties to which this sample design gave rise.

9. These advantages, nevertheless, have to be balanced against the loss of sampling efficiency inherent in cluster sampling. Several studies of geographical variance of vital rates in African countries have indicated an optimum cluster size of a few hundred persons for vital-rate surveys. [11],[12] Quite large deviations from the optimum will generally have little effect on sampling efficiency. This should not be pushed too far, however. Indications are that the use of area units larger than 1,000 population (assuming 100 per cent coverage within area units) should be avoided. If the available sampling frame includes area units larger than this, it would be advisable to consider a preliminary field operation designed to create a sampling frame of smaller area units.

10. The recommended unit size of a few hundreds of population would generally correspond to approximately one week's work by an enumerator. Assuming that enumerators are to work full time on the project, it follows that they will be required to travel from one selected area unit to another. In a large country, therefore, two stages of area sampling may be required in order to group within a manageable distance the ultimate area units allocated to a given enumerator.

11. First-stage area units should normally be selected by systematic sampling within geographical strata. At least when there is only one stage of area sampling, the units should normally be selected with equal probability within strata. It may be mentioned that in many developing countries, available area sampling frames are not as satisfactory as could be hoped. A preliminary field operation for delimitation of the selected area units may often be necessary.

12. *Summary.* An area cluster sample is recommended, in which the ultimate area units should be areas of a few hundreds of population, the survey covering the whole population within the selected units. Area units should be selected by systematic sampling within geographical strata. In a large country, two stages of area sampling may be desirable.

### III. Number and Frequency of Rounds

13. The more closely spaced the rounds are, the more reliable the data on vital events, but, at the same time, the greater the cost for a given sample of person-months.

14. Experience in a number of countries seems to suggest that a period of one year between rounds is too long. Six months should probably be regarded as the maximum. In urban areas, where mobility tends to be very high, visits every three months may be necessary. [12],[13] The three-month period has, in fact, been used in most of the PGE projects, which are analogous to the multiround surveys discussed in this paper.

15. An additional advantage of a short period is that a check on births can be obtained by asking women whether they are pregnant and giving special attention in the follow-up round to those who had claimed that they were. [14]

16. While most multiround surveys have continued for a year, there is no objection to spreading the work over a longer period—except that for a given total expenditure, the data will take longer to become available. There is, indeed, some advantage in a long time-coverage, notably the smoothing of short-term fluctuations in the vital rates. This



possibility raises the question of whether a fresh sample should then be selected each year. It would appear preferable to stay with a fixed sample, however long the period, at least until there is significant respondent resistance. Repetition of the sample is not likely to lead to loss of sampling efficiency; while, on the other hand, if the follow-up concept is to be retained, each time the sample is changed there will be the additional cost of a complete round for the new baseline survey. In any case, a total survey period of less than one year should be avoided because of the need to eliminate seasonal variations.

17. *Summary.* For rural surveys, a six-month interval between rounds should be the maximum, and for urban surveys, perhaps three months (though more experience is needed for the latter). The same sample should be followed, without replacement, as long as the inquiry lasts—or at least until the sample households show resistance. The total survey period should be at least one year.

#### **IV. Independence of the Follow-Up Round**

18. A follow-up round can be organized in two ways: as a checking operation by the enumerator; or as an independent collection of data, followed by a matching operation in the office. The essential difference is that in the latter arrangement the enumerator conducting the follow-up round does not have access to the data of the initial round.

19. An enumerator who merely has to check off a list of people as being present or absent, alive or dead, can produce plausible results without ever leaving home. Clearly, if the follow-up enumerator operates in complete ignorance of the data from the initial round, this acts as an efficient check on his work. Unfortunately, the problems of matching presented by this procedure are formidable. In almost all rural areas of developing countries, the population does not make the rather sharp distinction which is familiar to educated people, between legal names, on the one hand, and "nicknames" or other informal names, on the other. As a result, the same person may easily

give his name differently if asked on different occasions, and third-party informants may report still another name. In such areas, moreover, it is common to find many people in the same neighborhood who have the same name. When these difficulties are added to the absence of addresses and the difficulty of making clear maps of villages which show individual houses in such a way that they can be identified by another enumerator, it will be appreciated that a completely independent follow-up is scarcely a practical proposition. It appears necessary, at the very least, to give the follow-up enumerator a list of heads of households. This leads to a rigorous check on the composition of households, but not on the accuracy of the household list itself. This procedure was used in the 1961–1963 survey of rural Morocco, but the subsequent matching difficulties led to rejection of the follow-up as a source of useful data in over 10 per cent of the primary sampling units, [2] and this was after a third-round operation in which all discrepancies between the first and second rounds had been followed up for reconciliation. (Such a reconciliation round must be regarded as an essential part of the type of survey in which the second round is carried out "blind"; one cannot automatically assume that any person present in the first round but unreported in the second has died, or that any baby reported in the second round but not in the first was born between the rounds.)

20. In the light of problems such as these, the method of "blind" follow-up has generally been regarded as impracticable. The difficulties are certainly very great and it does not seem possible to recommend it. At the same time, the alternative method, in which the enumerator merely has to check a list of names provided, obviously offers a strong temptation to the enumerator who is less than fully conscientious. Very careful supervision is therefore essential.

21. Follow-up enumerators should be given a list of the persons reported in the initial round and told to check each as living or dead, and if living, as present or absent. (Fuller details of this procedure are discussed below.) Fieldwork requires very careful supervision.



## V. Repeated Use of Questionnaires versus Transcription

22. In drawing up the procedures for a follow-up survey, a practical problem arises which has a bearing on many aspects of the work. If the follow-up enumerators are to be provided with a list of the persons to be followed up, should this be done by handing back the questionnaires that were filled during the earlier round or by copying out the list on to new questionnaire blanks? Both methods have been used in different countries. The advantages of each method are as follows:

(a) *Advantages of repeated use of the same questionnaires:*

- (i) The work of copying, which can be very substantial, is avoided;
- (ii) All data for a given household appear on a single questionnaire. This simplifies handling of documents and data processing;

(b) *Advantages of transcription:*

- (i) Data processing of the first round can begin as soon as questionnaires return from the field, and this work is not seriously interrupted by later rounds;
- (ii) Additional items, such as education and occupation, can be included in the first-round questionnaire. If this is attempted when the follow-up questionnaire is on the same sheet, the questionnaire becomes unmanageably large;
- (iii) In some cases, the follow-up is limited to a subsample of the first-round sample. In extreme cases, the first round may be a complete population census; in other cases, it may be a survey which is based on a large sample because it is intended to give a more detailed geographical breakdown of demographic characteristics than the vital rate follow-up. In either case, use of the same questionnaire for the first round and the follow-ups means an unnecessarily complex document for those households in the first-round sample which are not included in the subsample (generally a large majority);
- (iv) If transcription is used, it is possible to insert false, or dummy, names into the list. (The method was used in India, 1958-1959. [1]) This acts as an effective check on the fieldwork, though it is troublesome to organize and may be resented by enumerators. The method is scarcely feasible where the same questionnaires are used at all rounds.

23. *Summary.* Where the first-round questionnaire is already fairly complex, or where the first-round sample is more extensive, the

transcription method has a clear advantage. Otherwise, the balance of advantages probably lies with the method of repeat use of questionnaires.

## VI. Data Processing

24. In one year of observation, the number of vital events recorded in a population in a developing country would be very roughly one-fifteenth of the number of persons in the population. In a six-month period, it would be one-thirtieth. These facts suggest that it would be advantageous to adopt an independent data-processing programme for vital events as such, rather than to add them at the end of the data (card or tape) recorded for each person in the survey.

25. Probably the best procedure is to introduce one coding sheet for births and another for deaths, with one line for each event. Columns would be provided for characteristics of the parents in the case of births and the decedent in the case of deaths. Data would be transcribed by hand from the original questionnaires. It would be an advantage to enter the name of the infant and mother, or the decedent, and to complete the sheets area by area, so as to check on possible double reporting of the same event in more than one household in the area. If the population of the area is shown on the sheet, it is easy to check rapidly whether plausible data are being obtained. Such a sheet could then easily be processed, either by hand or by punching one card per line.

26. *Summary.* Births and deaths should be processed separately from the main population processing. Separate coding sheets for births and deaths, with one line per event, should be completed area by area and checked for double counting and plausibility. Process manually or punch one card per line.

## VII. Derivation of the Vital Rates

27. In general, the method of deriving vital rates from the questionnaire results is obvious, but special arrangements have to be decided upon for three special cases: infant deaths;



births to women who die before the birth is recorded; and births to or deaths of persons who move into or out of the sample area between rounds.

28. For convenience, reference is made to only two rounds in the discussion that follows. Generalization to three or more rounds presents no problem. The period of reference is that between the two rounds considered.

29. In theory, the events that should be counted in order to give the numerators of the vital rates are those affecting the population enumerated at the earlier round. More precisely, *births* should be those occurring between the rounds to mothers found in the sample area at the earlier round, and *deaths* should be those occurring to persons found at the earlier round or to infants whose birth is counted in accordance with the rule for births. The denominator of the rate should be the initial population plus half the natural increase between the rounds (i.e., half the births less half the deaths).

30. In practice, however, these definitions are not the best guide to accurate data collection. In particular, it is difficult to detect births to mothers who move out of the area between the rounds. A more satisfactory approach is to replace these by their counterpart: mothers who move into the sample area between rounds. The latter are accessible for questioning, so that data will be more reliable. Provided there is no net migration, those who move out are equal in number to those who move in, at least as a statistical expectation, since moving out of one place means moving into another. Even if there is net migration, the substitution of one group for the other is legitimate, provided one amends the denominator of the rate. It is easily seen that the correct denominator would be the population at the later round less half the natural increase.

31. The procedure given above fails, however, to allow for one category: births to mothers who were present at the earlier round, but who died before the later round. These births have to be detected in the course of recording the mother's death. Thus, for every death of an adult woman, one must ask whether she had a baby born since the earlier round.

32. With respect to deaths, there is no diffi-

culty in obtaining information on deaths of persons listed at the earlier round and not found at the later round, except for the case of a death following movement out of the sample area. It must be hoped that information for this rather rare group can be obtained from persons remaining behind. [15] The only remaining problem arises from deaths of infants born between the rounds. These deaths must be determined at the time of recording the infant's birth. Thus, for every birth recorded, one must ask whether the child is still living.

33. Note that, for both births and deaths, the concern is not whether the person was in the sample area at the time of the event. Note further that one does not count births to mothers who moved out of the area between the rounds and who are still living at the time of the later round—even if the child remains behind in the sample area. But if the mother is dead, no matter where she died, then her death and the baby's birth (as well as the baby's death, if this occurred) are counted. [16]

34. In most surveys, it is not possible to organize the time interval between rounds according to an exact schedule to the nearest day. An adjustment is therefore required to bring the rates to the equivalent of an exact 365-day period. This may be done by computing the mean date of the starting round, averaged over all sample households, the mean date of the finishing round, differencing the two to give the mean reference period, then raising by the ratio 365 to this mean.

35. Lastly, for computation of age-specific rates, adjustments will normally be needed to allow for the fact that different persons have their age recorded at different times during the survey. The majority have their age recorded at the first round, but those who appear for the first time at a later round will give their age as of that round. Assuming a country in which most people cannot give their date of birth, the best rules would appear to be as follows: for *age-specific fertility*, adjust all ages to the middle of the reference period by a statistical adjustment in the final table (for example, if 80 per cent of the sample gave their age six months before the mid-point date, add one year to a random 40 per cent of the mothers—i.e., raise 40 per cent



of each age group to the group that is one year older). For *age-specific mortality*, such an overall adjustment is inadequate, in view of the importance of infant mortality. The best procedure would seem to be to compute age at death for each decedent at the coding stage and to enter it on the coding sheet—to the nearest month if under 2 years, otherwise in completed years. [17]

36. *Summary.* The rates should be defined as follows:

(a) *Numerator of birth rate:* births during the period to mothers found at the later round, plus births during the period to mothers found at the earlier round who died between the rounds;

(b) *Denominator of birth rate:* population at later round minus half of the difference (births minus deaths);

(c) *Numerator of death rate:* deaths of persons found at earlier round, plus deaths of babies born between the rounds to mothers found at earlier round;

(d) *Denominator of death rate:* population at earlier round plus half of the difference (births minus deaths).

Technically speaking, the birth and death rates refer to slightly different populations, but normally this will not matter. The denominators of the two rates are, in theory, different, but the difference will be negligible unless net migration is very large. In practice, it will generally be acceptable to replace either denominator by the arithmetical mean of the populations recorded in the two rounds. Lastly, adjustments are required to bring the rates to a basis of exactly twelve months, and to bring ages to a common basis for computation of the age-specific rates.

## VIII. Examples of Questionnaires

37. Three questionnaires, all of which assume three rounds, are contained in Annex II to this paper:

Questionnaire I was prepared by the secretariat of ECA in 1966. This questionnaire was intended to be a model to assist African countries wishing to conduct multiround follow-up surveys. The interval assumed between rounds was one year;

Questionnaire II was prepared in Ghana by the Central Bureau of Statistics, with the assistance of an adviser from ECA. It was intended for use in the 1966–1967 general population survey, but the follow-up rounds of that survey were cancelled and the questionnaire was never used. It may be mentioned that Questionnaire II was drawn up

quite independently of Questionnaire I. The interval assumed between rounds was six months;

Questionnaire III was prepared for the Nigerian demographic survey of 1965–1966. [6] A six-month interval between rounds was intended, but the second round was cancelled, leaving only the first and third rounds, separated by an interval of twelve months.

38. It is not proposed to discuss here the relative merits of these questionnaires, but merely to draw attention to some of their features and to relate them to the preceding sections of this paper.

39. First, it should be noted that Questionnaires I and II are drafts which have never been tried, while Questionnaire III was actually used in a survey. Of the 266 sample areas in that survey, the number giving vital rates plausible enough for retention in the analysis was 182 (68 per cent) in the case of births and 212 (80 per cent) for deaths. These figures may appear discouraging, but account should be taken of the abnormal conditions in the country at the time of the survey, which made supervision difficult.

40. Questionnaires I and II attempt to cover all the main items for which there is a demand from demographers. Questionnaire III is a “minimum” questionnaire, intended to produce the vital rates in the simplest possible way.

41. For Questionnaires I and III, it was planned to use the same copy of the questionnaire at all rounds, while Questionnaire II was based on the transcription system. Thus, Questionnaire II is not self-contained: there is an additional round-one questionnaire, not shown here, which covered a number of other items—in particular, questions on total fertility.

42. Questionnaires I and II include a retrospective question on deaths to be asked even in the first round. Although deaths reported then are outside the reference period, the question helps to eliminate faulty inclusion in the reference period of deaths occurring before its beginning. [2]

43. Questionnaires I and II differ on the following points:

(a) Questionnaire I includes an item on current pregnancies. This question was rejected in Ghana as being offensive;

(b) Questionnaire II includes questions on marital status at each round. This allows computation of age-specific marriage rates;



(c) Questionnaire II probes in more detail than I for an explanation when a person listed at one round is not found at the next round and when a complete dwelling cannot be found (page 1 of II);

(d) The layout of Questionnaire I is simpler and more attractive than that of Questionnaire II.

44. It may be of interest to show in detail how the rates defined in the preceding section of this paper are actually obtained from one of these questionnaires. For this purpose, one may take Questionnaire II and assume a one-year reference period, covered by three rounds at approximately six-month intervals:

(a) *Numerator of birth rate*

Table A: births listed in columns 11 and 19;

Table B: births listed in columns 9 and 17;

Table C: births listed in column 14 (not column 8);

---


$$\text{Total} = B$$

(b) *Denominator of birth rate.* Strictly, one must first compute the mean of the populations of the second and third rounds:

Second-round population =

Table A: column 9 ("this household")

Table B: all persons listed

---


$$\text{Total} = P_2$$

Third-round population =

Table A: column 17 ("this household")

Table B: column 15 ("this household")

Table C: all persons listed

---


$$\text{Total} = P_3$$

$$\text{Denominator of rate} = \frac{1}{2} [P_2 + P_3 - \frac{1}{2} (B - D)]$$

In practice, unless net migration into or out of the sample area is very large, one can use simply the second-round population,  $P_2$ .

(c) *Numerator of death rate*

Table A: deaths listed in columns 8, 13, 16, 21 (care is needed to avoid double counting)

Table B: deaths listed in column 11, 14, 19

Table C: deaths listed in column 16 (not column 10)

---


$$\text{Total} = D$$

Note that Tables D and E on the back of the questionnaire serve only as checks. If there has been no error, the only additional events they would yield are those of persons who entered the sample area between rounds and died before the round immediately following. These deaths are not to be counted.

(d) *Denominator of death rate.* In theory one needs the mean of the populations of the first and second rounds:

$$\begin{aligned} \text{First-round population} &= \text{Table A, column 2} \\ &= P_1 \end{aligned}$$

$$\text{Denominator of rate} = \frac{1}{2} [P_1 + P_2 + \frac{1}{2} (B - D)]$$

In practice, one can normally replace this by  $P_2$ .

(e) *Adjustment for length of reference period.* Refer to dates of rounds on page 1 of questionnaire. Then:

Obtain mean first-round date for all households, which  $= d_1$

Obtain mean third-round date for all households, which  $= d_3$

Using a calendar, compute interval in days between these means, which  $= d_{1-3}$

Multiply all rates by  $365/d_{1-3}$ .



TEMP 150  
11/11/85 NT3



## ANNEX I

### Alternative Treatment of Deaths of Migrants

The method described above in paragraph 32 for deriving the death rate is unsatisfactory in one respect: it assumes that deaths of persons who have moved out of the sample area between rounds can be reliably reported by persons remaining in the area. There appear to be two alternative procedures which avoid this unrealistic assumption.

Instead of covering deaths of out-migrants, one can cover those of in-migrants. This has the theoretical advantage of putting the mortality estimation on the same basis as fertility. On the practical level, it replaces one difficulty by another. While deaths of in-migrants are more likely to be *known* to the reporting households than those of out-migrants, they are less easy to *elicit* since the enumerator has no point of reference—he cannot cite the in-migrant by name and, indeed, has no knowledge of his existence until the death is reported. It is difficult to judge with confidence which of the two methods is likely to give better results. The out-migrant method appears to have been used in all multiround surveys conducted in Africa, while the in-migrant method was used with apparent success in the Indian survey. [1]

A further alternative would be to estimate the deaths of in-migrants by applying the age-specific mortality rates, determined from the rest of the sample, to the age distribution of the surviving in-migrants, taking into account the average length of the period for which they have been at risk (half of the period between rounds). A variant of this would be to use this

procedure as a check on the results obtained by either of the methods already mentioned. If the check suggested serious underestimation, then the check figures might be used in preference to the reported data for deaths of migrants.

With any of these alternative procedures, the denominator of the death rate becomes the same as that of the birth rate and the two rates apply strictly to the same population. This is theoretically more satisfying and might be considered an advantage of the methods described in this annex; however, the very slight inconsistency involved in the method described in the text of the paper is of no practical significance.

Lastly, it should be noted that the entire question of how to treat deaths of migrants in a multiround survey is of very marginal importance, at least for any rural population. If the interval between rounds is one-half year, then the proportion of migrants between rounds is one-half the migration rate, and the period for which the reporting problem arises averages one-quarter year per migrant. Thus, the deaths that are at issue are those relating to a proportion of the population equivalent to one-eighth of the migration rate. Furthermore, there is no question of missing all of these deaths: the question at issue is the difference between two methods for this very small group. When all this is taken into account, it is clear that this difference will be extremely small in relation to the total number of deaths reported—almost certainly under 1 per cent of deaths.



**ANNEX II**  
**EXAMPLES OF QUESTIONNAIRES**



Questionnaire I. Draft questionnaire for follow-up survey on births, deaths and migration

Region.....  
District.....  
Town or village.....  
Street name & No. (if any).....  
E. A. No. ....  
Household.....

Country and date

PART A  
(See reverse for part B)

FOR ALL USUAL MEMBERS OF HOUSEHOLD				FOR ALL WOMEN AGED 14 Yrs. OR MORE						NO LONGER RESIDENT at ROUND 2		NO LONGER RESIDENT at ROUND 3				
Serial No.	NAME	Relationship to head of household	Sex M or F	Age last birth-day	TOTAL CHILDREN			LIVE BIRTHS IN LAST 12 MTHS.		Is this woman pregnant now? Yes/No	If dead, date of death	If living elsewhere, residence now				
					Born alive M F	Still living M F	No. of live births M F	Date of birth	Baby still living Yes/No				If no, date of death			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(18)	(19)
ROUND 1																
Date of visit.....																
1																
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
ROUND 2 NEW MEMBERS SINCE ROUND 1																
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(16)	(17)	(18)	(19)
21																
22																
23																
24																
25																



Questionnaire I (continued)

ROUND 3 NEW MEMBERS SINCE ROUND 2													Remarks	
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	For babies under 1 yr, serial no. of mother	For all arrivals from elsewhere, previous residence
31													(16)	(17)
32														
33														
34														
35														

Suggested definitions

- A household consists of one person living alone, or of a group of persons living together and making common provisions for eating.
- A usual resident is one who has lived with the household for 6 months or more, or intends to remain 6 months or more.
- Temporary means for less than 6 months.
- A live birth means the birth of a baby who cried or breathed, if only for a moment.

PART B

LIVE BIRTHS AND DEATHS IN HOUSEHOLD IN LAST 12 MONTHS											
(N.B. Cols. 9 to 12 should include all deaths, including any reported in part A and any reported in cols. 5 and 8 of part B)											
LIVE BIRTHS								DEATHS			
Serial No.	Sex M F	Date of birth	Baby still living	If dead, date of death	Serial no. of mother in part A	For mother not listed in Part A		Serial No.	Sex M or F	Date of death	Age at death
						If living elsewhere, place of residence	If dead, age at death				
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
ROUND 1											
ROUND 2											
ROUND 3											



## Questionnaire II. Ghana Vital Rates Survey

DRAFT  
CONFIDENTIAL

Prepared by:  
The Vital Statistics Section  
December 1966

Ghana Vital Rates Survey  
Central Bureau of Statistics  
Accra

REGION \_\_\_\_\_ ENUMERATION AREA NO. .... ☐ ☐ ☐ ☐ ☐

LOCAL AUTHORITY \_\_\_\_\_ SEGMENT NO. .... ☐ ☐

TOWN/VILLAGE \_\_\_\_\_ SERIAL NO. OF HOUSE  
OR COMPOUND. .... ☐ ☐ ☐

DETAILED ADDRESS OF HOUSE OR COMPOUND  
\_\_\_\_\_ SERIAL NO. OF HOUSEHOLD  
WITHIN HOUSE. .... ☐ ☐

\_\_\_\_\_ For this household  
Number of questionnaires used \_\_\_\_\_  
\_\_\_\_\_ This questionnaire is No. \_\_\_\_\_

FOR THIS HOUSEHOLD: Date of ..... 1st round \_\_\_\_\_  
2nd round \_\_\_\_\_  
3rd round \_\_\_\_\_

IF HOUSE CANNOT BE TRACED, GIVE REASON AND STATE WHERE HOUSEHOLD NOW LIVING

REASON: House destroyed ..... ☐  
Cannot find address. .... ☐  
Other (specify) ..... \_\_\_\_\_

HOUSEHOLD  
NOW LIVING: In this E.A. .... ☐ ..... Specify serial No. of house \_\_\_\_\_  
Outside this E.A. .... ☐ ..... Specify locality and region \_\_\_\_\_

Name of enumerator .....



Questionnaire II (continued)

TABLE A Enter present situation of each person listed below

To be completed at SECOND and THIRD rounds

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	COMPLETED AT 3RD ROUND							21	22					
COMPLETED IN OFFICE															COMPLETED AT 2ND ROUND							COMPLETED AT 3RD ROUND						
Serial number	Name	Sex M, F	Age	Relationship to head of household	Marital status NM,M,W,D at 1st Rd	Marital status NM,M,W,D at 2nd Rd	WHERE IS THIS PERSON NOW?				FOR FEMALES AGED 12 AND OVER BIRTHS BETWEEN 1ST and 2ND RDS				Marital status NM,M,W,D at 3rd Rd	WHERE IS THIS PERSON NOW?				FOR FEMALES AGED 12 AND OVER BIRTHS BETWEEN 2ND AND 3RD RDS								
							Living or Dead L, D	If living, where?	If dead, date of death	Date of birth	Sex M, F	Living or Dead L, D	If dead, date of death	Living or dead L, D		If living, where?	If dead, date of death	Date of birth	Sex M, F	Living or dead L, D	If dead, date of death							
01																												
02																												
03																												
04																												
05																												
06																												
07																												
08																												
09																												
10																												
11																												
12																												
13																												
14																												
15																												

TABLE B Are there any persons living here who are not listed above (including babies born since last visit)?

To be completed at SECOND and THIRD rounds

1	2	3	4	5	6	7	8	9	10	11	12	COMPLETED AT 3RD ROUND											19	20			
COMPLETED AT 2ND ROUND													FOR FEMALES AGED 12 AND OVER BIRTHS BETWEEN 2ND AND 3RD RDS														
Serial number	Name	Sex M, F	Age	Relationship to head of household	Marital status NM,M,W,D at 1st Rd	Marital status NM,M,W,D at 2nd Rd	REASON WHY NOT LISTED AT 1ST ROUND		FOR FEMALES AGED 12 AND OVER BIRTHS BETWEEN 1ST AND 2ND RD				Marital status NM,M,W,D at 3rd Rd	WHERE IS THIS PERSON NOW?				Living or Dead L, D	Sex M, F	Date of birth	Living or Dead L, D	If dead, date of death					
							E = Error, N = Not yet born O = Living elsewhere (specify)	Date of birth	Sex M, F	Living or Dead L, D	If dead, date of death	Living or Dead L, D		If living, where?	If dead, date of death												
01																											
02																											
03																											
04																											
05																											



Questionnaire II (continued)

TABLE C Are there any persons living here who are not listed above (including babies born since last visit)?

To be completed at THIRD round

COMPLETED AT 3RD ROUND																
Serial number	Name	Sex M, F	Age	Relationship to head of household	Marital status NM, M, W, D at 1st Rd	Marital status NM, M, W, D at 2nd Rd	FOR FEMALES AGED 12 AND OVER BIRTHS BETWEEN 1ST AND 2ND RDS				Marital status NM, M, W, D at 3rd Rd	REASON WHY NOT LISTED AT 2ND ROUND		FOR FEMALES AGED 12 AND OVER BIRTHS BETWEEN 2ND AND 3RD RDS		
							Date of birth	Sex M, F	Living or Dead L, D	If dead, date of death		E = Error, N = Not yet born O = Living elsewhere (specify)	Date of birth	Sex M, F	Living or Dead L, D	If dead, date of death
01																
02																
03																
04																
05																

TABLE D Has any household member not listed overleaf died since the 1st round (including babies born since the 1st round)?

To be completed at SECOND round

COMPLETED AT 2ND ROUND							
Serial number	Name	Sex M, F	Age at death	Relationship to head of household	Marital status NM, M, W, D at death	REASON WHY NOT LISTED AT 1ST ROUND	
						E = Error N = Not yet born O = Living elsewhere (specify)	Date of death
01							
02							
03							

TABLE E Has any household member not listed overleaf died since the 2nd round (including babies born since the 2nd round)?

To be completed at THIRD round

COMPLETED AT 3RD ROUND							
Serial number	Name	Sex M, F	Age at death	Relationship to head of household	Marital status NM, M, W, D at death	REASON WHY NOT LISTED AT 2ND ROUND	
						E = Error N = Not yet born O = Living elsewhere (specify)	Date of death
01							
02							
03							

Questionnaire designed by Mr. J. Y. Owusu and Dr. Christopher Scott.

Reduced from a 4-page original printed front and back on a single sheet 34 cms. x 43 cms. (13 ins. x 17 ins.). Tables A, B, and C appear together on the center-page spread.

Notes



### Questionnaire III. Rural Demographic Sample Survey, Nigeria, 1965-1966

(Example of Questionnaire completed through 2nd round)

No.	Name	Sex M F	Age	Marital status	2nd round		3rd round		Household No. 216
					Code	Date	Code	Date	
1	BELLO ADELAKUN	M	45	2	L				Farmer Household No. 195
2	SAFURATU ASHA	F	42	2	L				<p>Is any member of the household operating a farm?            Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>Is any member of the household operating any other enterprise?            What kind?            .....            .....            .....</p>
3	MUSILI ADELAKUN	F	18	1	TRANSFER TO NO. 145				
4	LAMIDI ADELAKUN	M	15	1	L				
5	LASISI ADELAKUN	M	8	1	L				
6	KUDITATU ADELAKUN	F	5	1	D	2/9/65			
7	SAKA ADELAKUN	M	2	1	L				
8	SIKIRU EFUNKUNLE	M	64	3	MO	15/8/65			
9	TAIBATU, CHILD OF NO. 2	F	0	1	NB	10/10/65			
10									
11									<p style="text-align: center;">Marital Status</p> <p>1 = single            2 = married            3 = widowed            4 = divorced or separated</p> <p style="text-align: center;">2nd and 3rd round code:</p> <p>L = living in area            D = dead            MO = moved out            NB = newborn, now living            NBD = newborn who later died            ? = unknown            MI = moved in</p>
12									
13									
14									
15									

Questionnaire designed by Mr. V. Kannisto.

Reduced from a single-page original mimeographed on one side only, 20 cms. x 33 cms. (8 ins. x 13 ins.).



## Notes

- [1] Government of India, "Preliminary estimates of birth and death rates and of the rate of growth of the population," *National Sample Survey*, No. 48 (New Delhi, 1961).
- [2] G. Sabagh and C. Scott, "A comparison of different survey techniques for obtaining vital data in a developing country," *Demography*, vol. IV (1967), p. 759.
- [3] Other attempts, based on acceptance of the single-round approach, include the method of adjustment following analysis by length of recall period, developed in R. Som, *Recall Lapse in Demographic Enquiries* (Bombay, Asia Publishing House, 1973); and the procedures for estimating fertility and mortality from defective data given in W. Brass et al., *The Demography of Tropical Africa* (Princeton, N. J., Princeton University Press, 1968).
- [4] *Guanabara Demographic Pilot Survey* (United Nations publication, Sales No.: 64.XIII.3). See also C. G. Arretx and J. L. Somoza, "Survey methods, based on periodically repeated interviews, aimed at determining demographic rates," *Demography*, vol. II (1965), p. 289.
- [5] Vaino Kannisto, *Population Increase in Indonesia* (Djakarta, Central Bureau of Statistics, Statistical Research and Development Center, 1963). Mimeographed.
- [6] Nigeria, Federal Office of Statistics, *Rural Demographic Sample Survey: 1965-66* (Lagos, 1968).
- [7] J. Vallin, C. Paulet and C. Tarifa, *Enquête nationale démographique: Résumé provisoire du premier passage* (Tunis, Sous-Direction des Statistiques Démographiques, 1968). Mimeographed.
- [8] More recently the follow-up method has been used in Algeria (1970), Senegal (1970-71), Lesotho (1971-72), Haiti (1972), Honduras (1972), and Saudi Arabia (1972). References not yet available.
- [9] For a broader discussion of the entire problem of vital rate estimation in developing countries, see W. P. Mauldin, "Estimating rate of population growth," in B. Berelson et al., eds. *Family Planning and Population Programs* (Chicago, University of Chicago Press, 1966).
- [10] A useful recent reference is P. Lauriat, "Field experience in estimating population growth," *Demography*, vol., IV (1967), p. 228. By far the largest of the population growth estimation (PGE) operations currently under way is the Sample Registration Scheme in India, whose progress is reported regularly by the Registrar General in the monthly *Sample Registration Bulletin* (New Delhi).
- [11] United Nations document E/CN.14/SM/3, para. 3. 2. 3.
- [12] C. Scott and J. B. Coker, "Sample design in space and in time for vital rate surveys in Africa," paper submitted to the London Conference of the International Union for the Scientific Study of Population, September 1969.
- [13] Relatively little information is available on follow-up surveys in urban areas. Two studies in Africa have been reported: Abidjan, 1963 (two rounds, separated by one year); and Yaoundé, 1964/65 (two rounds, separated by six months). In both cases, it was found that because of extremely high mobility, very careful attention was needed at the data-processing stage in order to reach valid conclusions. See L. Roussel, "Déplacements temporaires et migrations," *Afrique noire: démographie comparée* (Paris, Institut national de la statistique et des études économiques, 1967), vol. 7.
- [14] The reluctance to use this question in some countries seems to have little foundation. There is no recorded instance of the question causing resentment, while there are surveys on record in which the question has been asked, without apparent difficulty, against the advice of local experts.
- [15] Two alternative approaches are described in Annex I to this paper.
- [16] In the rare cases where the mother's death takes place in another area, such information is, of course, likely to be inaccurate.
- [17] For those over 2 years whose age was first given in completed years, if it is necessary to add six months this should be done by adding one year to every second such case; similarly, if it is desired to add three months, add one year to every fourth case, etc.



Publications of the POPLAB Program (cont.)

**The Reprint Series (Cont.)**

5. FIELD EXPERIENCE IN ESTIMATING POPULATION GROWTH  
by Patience Lauriat
6. MEASUREMENT OF POPULATION CONTROL PROGRAMS: DESIGN  
PROBLEMS OF SAMPLE REGISTRATION SYSTEMS  
by Forrest E. Linder
7. SAMPLE VITAL REGISTRATION EXPERIMENT  
by Joseph A. Cavanaugh
8. SURVEY METHODS, BASED ON PERIODICALLY REPEATED  
INTERVIEWS, AIMED AT DETERMINING DEMOGRAPHIC RATES  
by Carmen Arretx and Jorge L. Somoza
9. EVALUATION OF BIRTH STATISTICS DERIVED RETROSPECTIVELY  
FROM FERTILITY HISTORIES REPORTED IN A NATIONAL  
POPULATION SURVEY: UNITED STATES, 1945-1964 by Monroe G.  
Sirken and Georges Sabagh
10. A COMPARISON OF DIFFERENT SURVEY TECHNIQUES FOR  
OBTAINING VITAL DATA IN A DEVELOPING COUNTRY  
by Georges Sabagh and Christopher Scott
11. TECHNICAL PROBLEMS OF MULTIROUND DEMOGRAPHIC SURVEYS  
by Christopher Scott
12. VITAL EVENT NUMERATION SYSTEM AS A NEW TOOL FOR  
MEASURING POPULATION CHANGE by Forrest E. Linder
13. PROBLEMS IN DESIGNING INTERVIEW SURVEYS TO MEASURE  
POPULATION GROWTH by Daniel G. Horvitz



## Publications of the POPLAB Program:

### **The Scientific Report Series**

1. THE CONCEPT AND THE PROGRAM OF THE LABORATORIES FOR POPULATION STATISTICS by Forrest E. Linder
2. ORGANIZATION AND METHODS OF THE DUAL-REPORT SYSTEM IN TURKEY by Eliska Chanlett
3. SUBJECT MATTER COVERAGE IN THE DUAL-REPORT SYSTEMS OF INDIA, PAKISTAN, TURKEY, AND LIBERIA by James R. Abernathy and Anders S. Lunde
4. THE FIRST AND SECOND INTERNATIONAL POPLAB CONFERENCES
5. ORGANIZATION AND METHODS OF THE DUAL-REPORT SYSTEM IN LIBERIA by Joan W. Lingner
6. ORGANIZATION AND METHODS OF THE DUAL-REPORT SYSTEM IN PAKISTAN by James R. Abernathy
7. THE THIRD ANNUAL INTERNATIONAL POPLAB CONFERENCES
8. THE MINDANAO CENTER FOR POPULATION STUDIES, A PHILIPPINE POPLAB REPORT by Francis C. Madigan, S.J.

### **The Manual Series**

1. MAPPING AND HOUSE NUMBERING by Dorothy S. Cooke
2. OPERATIONAL CONTROL OF SAMPLE SURVEYS by Walt R. Simmons
3. DESIGNING FORMS FOR DEMOGRAPHIC SURVEYS by Monroe G. Sirken
4. PLANNING THE RESEARCH INTERVIEW by John Scott and Eliska Chanlett

### **The Reprint Series**

1. ON A METHOD OF ESTIMATING BIRTH AND DEATH RATES AND THE EXTENT OF REGISTRATION by C. Chandra Sekar and W. Edwards Deming
2. THE USE OF SAMPLING FOR VITAL REGISTRATION AND VITAL STATISTICS by Philip M. Hauser
3. THE DESIGN OF AN EXPERIMENTAL PROCEDURE FOR OBTAINING ACCURATE VITAL STATISTICS by Ansley J. Coale and SOME RESULTS FROM ASIAN POPULATION GROWTH STUDIES by William Seltzer
4. A CRITIQUE OF METHODS FOR ESTIMATING POPULATION GROWTH IN COUNTRIES WITH LIMITED DATA by W. Brass

(continued on inside back cover)